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THE EFFECT OF KLEPTOPARASITIC PRESSURE ON HUNTING BEHAVIOR AND PERFORMANCE OF HOST MERLINS

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Kleptoparasitism, or food piracy, is widespread among birds and is most prevalent among Order Falconiformes and Order Charadriiformes (Brockmann and Barnard 1979). Among the Falconiformes, 10 North American species are known kleptoparasites (Paulson 1985); seven species kleptoparasitize other raptors (Brockmann and Barnard 1979). In this paper I document and describe kleptoparasitic activities directed at host Merlins (*Falco columbarius*) during winter in western Washington. In addition I describe how kleptoparasitism may influence hunting tactics and performance by host Merlins.

Observations were made during winter (Nov–Mar) 1979–1987 at several estuarine sites in western Washington as part of a study on the relationship between Merlins and their primary prey, Dunlin (*Calidris alpina*) (Buchanan et al. 1988). One hundred and eleven hunting flights by Merlins (with known outcomes) were observed in that study (1979–1985), and an additional 22 flights were observed subsequently; all were directed at Dunlins.

I compared behavior and performance of hunting Merlins when other raptors were both present and absent. Raptors were considered present only if they were judged close enough to successfully attack a Merlin with prey before the Merlin could reach cover (a distance usually of ca. 200 m). Glaucous-winged Gulls (*Larus glaucescens*) also kleptoparasitized Merlins, but I did not consider them in the analysis because of their constant presence.

A hunting flight was defined as a flight involving any number of capture attempts at suitable prey (see Buchanan et al. 1988). A capture attempt is an attempt to seize or knock down a specific prey individual during a hunting flight. I determined duration of hunting flights using a watch. In some cases I was unable to measure the exact duration, thus hunting flights were grouped into one minute intervals and comparisons were made using the Kolmogorov-Smirnov two-sample test (Sokal and Rohlf 1981). In many cases small sample sizes precluded statistical analysis.

Incidences of Kleptoparasitism. Kleptoparasitism was observed five times and occurred after 18.5% of all successful hunting flights by Merlins (N = 27). Kleptoparasitism by a Red-tailed Hawk (*Buteo jamaicensis*) and by a Merlin both occurred in mid-air, whereas a Northern Harrier (*Circus cyaneus*) chased a Merlin from its partially consumed prey on the ground in an open field. On two other occasions Merlins dropped their prey when another Merlin began pursuit; in one case the Dunlin was recovered by a Glaucous-winged Gull and in the other case the Dunlin flew to safety. On three occasions Merlins were observed to knock down or force Dunlins into water without capturing them (i.e., not considered successful hunts); the prey was subsequently taken by another bird. In one case the Dunlin was taken by a Bald Eagle (*Haliaeetus leucocephalus*) and twice by Glaucous-winged Gulls Bald Eagles twice attempted unsuccessfully to capture Dunlins which had been dropped or forced into water.

Kleptoparasitic Threat and Hunting Behavior. Merlins in western Washington commonly use one of two methods when initiating a hunting flight (Buchanan et al 1988). The most common technique is a conspicuous high flight, usually followed by stoops at a flock or individual birds. The second technique is a low stealth approach which the Merlin uses to surprise its prey.

The success rate for hunting flights was 21.0% (N = 81) when other raptors were absent and 17.6% (N = 34) when other raptors were present. At Kennedy Creek Delta, where nearly half (N = 62) of the hunting flights were observed, the success rate was much lower when other raptors were present (10.0%; N = 30) than when other raptors were absent (21.9%; N = 32).

Because the conspicuousness of stealth attack flights and high flights appeared to be different I compared the duration and effectiveness of each technique when other raptors were present and absent. For stealth attack flights I found that flights were similarly successful when other raptors were present or absent (19.0% and 14.7%, respectively), the distributions of hunting flight durations were similar (see Fig. 1A), and the number of capture attempts per flight was similar (2.43 [S.D. = 2.55] when raptors present vs. 2.14 [S.D. = 2.42] when raptors absent). For high flights I found that when other raptors were absent the success rate for hunting flights was higher (25.5% vs. 15.4% when other raptors present) and each flight included more capture attempts (5.58 [S.D. = 7.36] when raptors absent vs. 2.78 [S.D. = 2.01] when raptors present). A small sample size resulted in non-significant findings; however, using the Kolmogorov-Smirnov two-sample test, the difference in distributions of flight durations (Fig. 1B) was significant (D = 0.421), as there were more lengthy flights (following the initial high approach) when raptors were absent and more brief flights when raptors were present.

When other raptors were present, all six successful hunting flights lasted <2 min, whereas seven of 17 successful flights lasted between 2 and 8 min when raptors were absent. All five kleptoparasitic incidents occurred after hunting flights lasting <3 min.

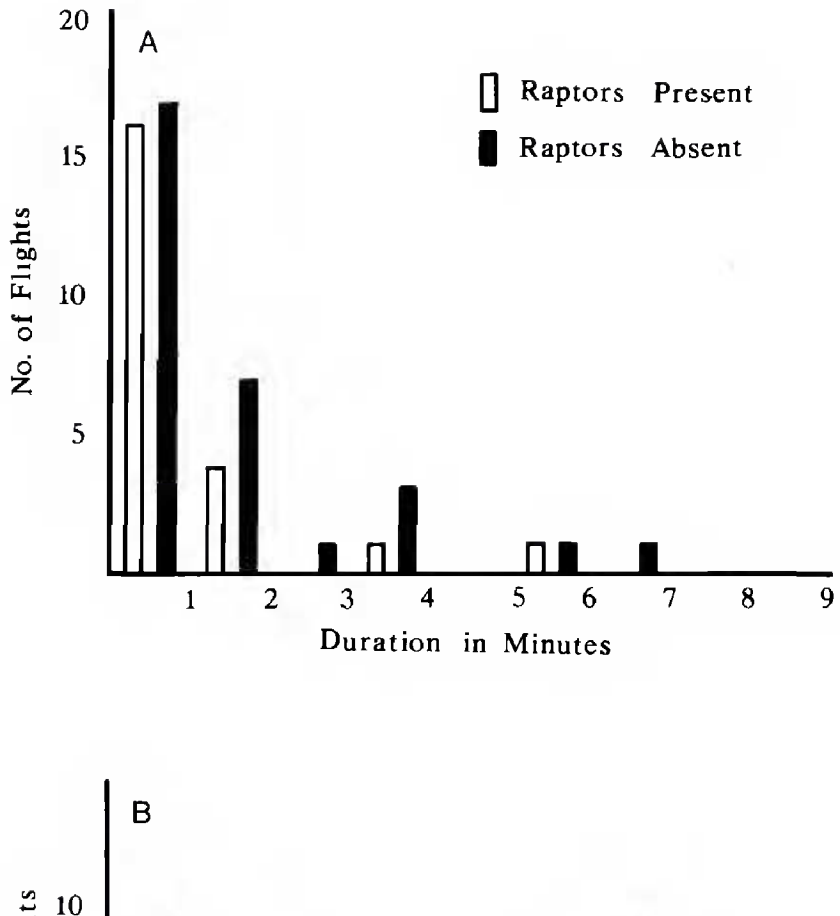

Figure 1. Duration of stealth (A) and high (B) hunting flights by Merlins when other raptors were present or absent.

Discussion. Despite a small sample size, these findings indicate that when raptors are present Merlins hunt effectively by using the low stealth flight, and less effectively by using high flights. Merlins may recognize potential kleptoparasites and attempt to minimize wasted effort by avoiding lengthy and conspicuous hunting flights if the risk of food piracy is high. Hosts in other kleptoparasitic relationships are known to alter their foraging strategy to optimize intake and reduce opportunities for piracy. Barnard and Thompson (1985) found that Northern Lapwings (*Vanellus vanellus*) and Greater Golden-Plovers (*Pluvialis apricaria*) took less profitable (smaller) prey when kleptoparasitic Common Black-headed Gulls (*Larus ridibundus*) were present.

Although the results of this study indicate that kleptoparasitic pressure may depress hunting success, the success rate for hunting flights by Merlins in Washington (22.5%; Buchanan et al. 1988) was significantly higher than reported from California (12.5%; Page and Whitacre 1975). Whether the magnitude of kleptoparasitic pressure is greater in Washington than California is unknown However, substantial differences exist between the two regions in hunting behavior (foraging polymorphism; see Morse 1980). Regional differences in kleptoparasitic pressure may result in increased foraging polymorphism and differences in success rates. For example, a preponderance of high flights in Washington (Buchanan et al. 1988) may allow Merlins to continuously assess chances of being kleptoparasitized. The impact of kleptoparasitic pressure might therefore be a consideration when making comparisons of hunting behavior.

Prey caching may be a response to kleptoparasitic pressure on host Merlins in western Washington. Winter caching by Merlins has been documented (Pitcher et al. 1979, Warkentin and Oliphant 1985) and was twice suspected during the present study. Food caching should be examined as a response to kleptoparasitism when both are known to occur.

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